

R E M A R K S

Applicant has carefully considered the Office Action of January 9, 2004 rejecting all of the claims. The present response is intended to fully address all points of objection raised by the Examiner, and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application are respectfully requested.

A petition for an extension of response time is attached.

The specification has been amended to provide increased clarity with regard to the push force provided by the gas blast, as described further herein.

Claims 1 and 11-14 have been amended. Claims 2-4 have been deleted. Therefore, claims 1 and 5-15 remain in the case.

The present invention discloses an integrated actuator for an optical switch mirror array, which uses a novel integrated actuation technique combining electrostatic or electromagnetic (or both) actuation in combination with air (or any other gas) blast actuation. This combined approach provides integrated actuation, by using the gas blast to move the mirror to a tilt position, and with the application of the proper voltage and/or electrical current, to have the pull-in effect take over and move the mirror to its final position. Thus, the invention can be simply defined as a combination of a gas blast and electrostatic and/or magnetic pull-in effect as applied to micro-actuated mirrors for use in optical switches as well as optical cross-connects which are used in communication systems.

The pull-in effect can be achieved also by a magnetic field. Therefore, the invention also covers a combination of the gas blast with magnetic actuation with or without

electrostatic actuation. The addition of a magnetic force is particularly important since the latter can be used to latch the mirror in case of power failure.

The advantage of using the gas blast is that the mechanical moment provided by a relatively small air pressure difference is significantly larger than the moment available from electrostatic or electro-magnetic actuation at reasonable field strength levels. Thus, the mirror structure can be based on use of superior manufacturing materials employing thicker, crystalline silicon, and this increases reliability and rigidity.

The use of a gas blast to assist the electrostatic or electromagnetic actuation is achieved by applying the gas blast to the mirror to develop an angular position which is sufficient for the electrostatic or electromagnetic actuation to overtake the spring moment or restoring mechanical torque of the rotation axis. This can be achieved at a moderate or low voltage, thereby increasing reliability. The assistance provided by the gas blast enables the construction to benefit from a thicker axis of rotation which is not subject to breakage and is not fragile as with the prior art design.

The specification has been amended at page 7, first line, to indicate that the force developed by the gas blast is a push force. This amendment is based on the sentence context, since the gas blast provides a "force against the restoring torque of the axis" of rotation, and the words "force against" clearly define a push force.

Claims 1 and 11-14 have been amended to more clearly define the invention as an integrated actuator for an optical switch mirror array for use in optical communication systems, which uses a non-electromagnetic tilting push force for achieving an initial tilt position, based on use of a gas blast apparatus, and an

electromagnetic pull-in force to complete the tilt of said mirror to its final optical switching position.

Support for this amendment is based on the recitation of now-deleted claim 3, and support in the specification at page 7, last paragraph, which describes the gas blast apparatus.

The Examiner has rejected claims 1-15 under Sec. 103(a) as being unpatentable over Chertkow in view of Wu.

The Examiner points out that the Chertkow reference discusses a MEMS device and that "the medium of a MOEMS switch fluid is typically air, but a vacuum, inert gas, or other suitable fluid may also be used (col. 2, line 53-63)". Use of the term "medium" is clear from the context, especially in light of the statement at col. 2, line 58 of the cited reference: "transmission of light within the switch medium..."

It appears to the Applicant that the Examiner has misconstrued the disclosure of Chertkow, since the Chertkow reference refers to the transmission media through which the light beam propagates, while Applicant is not dealing with transmission media at all.

Instead, Applicant's invention utilizes a gas blast for achieving an initial tilt position of a mirror in an an optical switch mirror array. Thus, it is the physical push force of the gas blast that is employed by the invention, and the gas blast is not used as information transmission media, so that the invention is clearly distinguished from the reference.

The Wu reference discloses a MEMS optomechanical switch, and the use of attractive and repulsive forces is described. These forces are used in "push-pull" arrangements, and the Examiner has cited this reference in regard to its teaching of "push-pull" forces, which he considers to be equivalent to the pull-in force used in

the invention to complete the tilt of the mirror to its final optical switching position.

In his treatment of the subject of push-pull forces, Wu relates only to electromagnetic and/or electrostatic forces. Nowhere in Wu is the subject of a gas blast mentioned.

Therefore, Applicant believes that the Examiner cannot fairly apply the Chertkow reference in combination with the Wu reference to assert that "... these type teachings are very elementary teachings in this art... involves only routine skill of the art using combined forces in order to achieve pull in to complete the tilt of the mirror to its final position".

In fact, there is absolutely no reason to suppose that Chertkow's teaching of gas transmission media would be combined with Wu's teaching of push-pull forces, and to say otherwise, is to attempt hindsight reconstruction of the invention using the references, without any basis.

Although not relied upon, the Rimmel reference is introduced as a teaching of an air blast for manipulating glass fibers during production. Clearly, this reference is non-analogous art, since movement of glass fibers during production is not like use in a MEMS device, and this reference cannot be used even to suggest a combination leading to the present invention. Therefore, the Rimmel reference adds nothing to the teaching of Wu or Chertkow which would render the present invention obvious.

It is the Applicant's position that the combination of the Chertkow and Wu references to form the basis of the Sec. 103(a) rejection is improper, and Applicant respectfully requests that it be withdrawn.

Therefore, claims 1 and 11-14 are deemed to be patentable, and the dependent claims are deemed to be patentable as being based thereon.

In citing the references under Sec. 103(a), the question is raised whether the references would suggest the invention, as stated in the decision of *In Re Lintner* (172 USPQ 560, 562, CCPA 1972);

"In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the references before him to make the proposed substitution, combination or other modification."

Similarly, *In Re Regel* (188 USPQ 136, CCPA 1975) decided that the question raised under Sec. 103 is whether the prior art taken as a whole would suggest the claimed invention to one of ordinary skill in the art. Accordingly, even if all the elements of a claim are disclosed in various prior art references, the claimed invention taken as a whole cannot be said to be obvious without some reason given in the prior art why one of ordinary skill would have been prompted to combine the teachings of the references to arrive at the claimed invention.

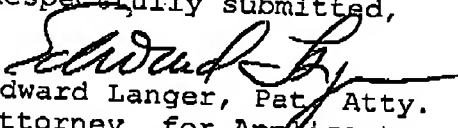
Simply put, and as stated in *In Re Clinton* (188 USPQ 365 CCPA 1976), "do the references themselves... suggest doing what appellants have done", such that there is a requirement that the prior art must have made any proposed modification or changes in the prior art obvious to do, rather than obvious to try.

It is respectfully put forward by the Applicant that there is no reason to consider the prior art references, Chertkow, Wu and Rimmel, either individually or in combination, as rendering the invention obvious, since none of them discloses an integrated actuator for an optical switch mirror array for use in optical communication systems, which uses a non-electromagnetic tilting force for achieving an initial tilt position,

based on use of a gas blast apparatus, and an electromagnetic pull-in force to complete the tilt of said mirror to its final optical switching position.

In view of the foregoing remarks, all of the claims in the application are deemed to be allowable. Further reconsideration and allowance of the application is respectfully requested at an early date.

Respectfully submitted,


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